DRAFT
DNCT
Meeting Notes
3/16/99
9:30-4:30

Attendees: Mike Fris, Matt Vandenberg, Karl Halupka, Pete Chadwick, Jim White, Dale Sweetnam, Bruce Herbold, Sheila Greene, George Barnes, Curtis Creel, Paul Fujitani, Serge Birk, Pete Rhoads, Peter Louie, Art Hinojosa, Dave Briggs, Dave Fullerton, Earl Nelson, BJ Miller, Jim Buell, Russ Brown, Tom Cannon, David Forkel, Ron Ott

Near Term Agenda:
i.   First Cut at EWA - agree on a draft scenario and how to analyze
ii.   How to manage EWA
iii.   How to use EWA
iv.   How to analyze/game EWA

Today's Agenda
Morning:
- Overall plan for gaming
- EWA assets
- Biol rules

Afternoon:
- George Barnes -- New methods for DWRSIM
- Peter Louie/Russ Brown - Gaming techniques
- Get agreement on draft scenario.

Schedule of Activities

Sun	Mon	Tue	Wed	Thu	Fri	Sat
14th		DNCT agreement on draft scenario		Biology meeting 9:30-12:00		
21th		Georg's hard-wired runs		Gaming	Gaming	
28th		Gaming		Gaming	Results of 1st gaming.	

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Highlights

I. Highlights of Bruce Herbold Morning Gaming Session

- Bruce proposed a set of strawman game rules.
- He proposed a new DWRSIM model run with fewer prescriptions with large EWA to compare with last fall's federal scenario. Run would be limited to EWA tools that get water into the account by relaxing E/I and constructing new facilities, and possibly relaxing in-Delta AFRP. It would not include options that would change other standards (e.g., outflow, X2, or upstream AFRP).
- Gaming would involve using historical fish salvage, population, and distribution data, along with historical hydrology and operations data. DWRSIM would provide (1) corresponding data tables (for ops and hydrology) under new baseline (Accord plus AFRP and new facilities) for comparison, and (2) same data and EWA water under additional EWA run.
- Gamers would determine what new baseline lacks for fish and apply EWA account for those purposes, keeping track of EWA use (and where stored) on a separate spreadsheet.
- Gamers would decide through iterations how to use EWA water and decide whether there is enough water to solve problems that would provide comfort (assurances) to ESA agencies.
- Various concerns including how do we predict fish changes consistent with two new model runs (new baseline and new baseline + EWA changes) to corresponding DWRSIM predicted changes in hydrology and operations. Suggestions varied from just doing it the best we can and not worrying about it, to making formal rules about specific responses of fish to changes in hydrology.

II. Highlights of Dave Fullerton's Morning Scenario Discussions

Dave presented two scenarios:

- Type 1A is EWA contract with EWA generated by relaxing standards, new facilities, and purchases.
- Type 1B is EWA getting budget based on overall benefits that go to projects from relaxing standards and new facilities.
- Type 1A was chosen.
- General consensus that contracting is preferred to strict accounting approach.
- Concerns about In-Delta storage water quality impacts. Will defer to other tech team looking into this. Can constrain use of this water to ag use, but would lose some of value for EWA.

III. Highlights of Bruce Herbold's Afternoon Session

Bruce presented some suggested rules for biological gaming.

- Many questions on assumptions.
- Some level of agreement on how to proceed.
- Questions were posed for biol team for Thursday meeting.

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- Suggested preprocessing biology data to predict salvage and population abundance and distribution under new baseline. Not in agreement on how to do this, or whether it is possible or necessary.
- Also discussed how to predict effect of employing EWA.

IV.   Highlights of DWRSIM Support Afternoon Session by George Barnes

- CALSIM will not be available so we will use DWRSIM.
- Three year sequences studies will provide uncertainty assessment and range of potential outcomes.

V.   Highlights of Russ Brown's and Peter Louie's Afternoon Session

- Russ presented computer simulation to show how gaming can be done in real time.
- Considerable debate as to utility of using Russ's Daily Ops Model for gaming if it is not consistent with DWRSIM.
- Concern expressed about ability to adjust baseline when rules change.
- Operators felt that Daily Ops Model provided realistic output for gaming purposes.
- Modelers agreed to work to make the two models more consistent.
- Daily Ops Model hopefully will be ready to start next Tuesday.
- Concern that hydrology is adjusted by models to new baseline, but not biology data. How do we adjust biology (salvage, population, and distribution data) data to the new hydrology baseline? How do we then further adjust biology if we make changes with EWA account?
- Reminder that we are gaming to get a relative feel as to how the EWA would work and how big is should be. General agreement that this could be accomplished with the available tools.

Detailed Summary

Actions: (see bold underlines)

Session 1: Gaming Tools and Rules - Bruce Herbold + Handout

Proposed Gaming Tools
A.   Historic salvage data 1985-1997 - daily data for key species
B.   Historic fish abundance and distribution data - daily data for key species
C.   Historic Hydrology - daily data for key parameters
D.   DWRSIM runs - (1) to provide above hydrology data under new baseline (Accord + AFRP etc); and (2) to provide run without E/I and in-Delta AFRP (and other new features such as JPOD, enlarged Shasta, etc) with max EWA account and new water supplies for

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ag/urban.
E.   EWA Spreadsheet - to track EWA water additions and debits.
F.   Gmodel - to track water quality changes
G.   What's missing: Process needed to predict changes in fish salvage, abundance, and distribution under new baseline so that EWA gaming can operate under new baseline.

Gaming Rules
•   Various rules presented to relate changes in hydrology and exports to population entrainment reductions (e.g., a reduction in exports of 25% reduces entrainment losses 25%).
•   Productivity changes are assessed for salmon, striped bass, delta smelt, and splittail based on employing EWA above new baseline.

Evaluating Results
•   Compare new baseline hydrology with historic - are changes enough to achieve our biological goals? What is missing (X2, less exports at key times, etc.)?
•   Entrainment and productivity effects from employing EWA.
•   Was there enough EWA water to make a difference?
•   What EWA tools were most effective, for what?

Objectives for Today
How big do we need to make EWA?
How should we use it? What biological rules?

Questions and Comments
1.   Q: What time frame should we use? A: 1983-1997 + six year drought performance.
2.   C: Biological rules proposed are based on pure speculation. A: No data to substantiate rules - challenging dilema for all of us. We should modify rules as group sees fit, but we need rules so that we can score performance.
3.   C: Two step process (new baseline first, then new EWA) - difficult to separate the effects of two steps - population and entrainment benefits of new baseline difficult to assess before adding new EWA to make up difference.
4.   C: This is real problem, but we have to make some guesses. Target is to make ESA agencies comforable with use and degree of EWA implementation. Is adding EWA enough above new baseline of Accord and AFRP to provide assurances for new CALFED features that generate new water supply (e.g., raising Shasta, JPOD, expanded Banks, etc.)
5.   C: There is a major disagreement on the degree of benefit to reducing salvage from the hydrology changes proposed. We presume that salvage (entrainment) will respond as predicted, and that the distribution of fish and salvage won't change significantly with the new baseline, let alone application of the EWA water. R: We should decide what to do with this gaming exercise - it is not possible to resolve these issues in our short time frame.

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6.   C: Timing of fish is most important. Gaming simply provides an example of one timing sequence and how we would respond to it - fully knowing that it will likely be different in the future. Timing of fish distribution will change.

7.   Q: Should we adjust historic salvage records to new baseline? Should we have historical, predicted for new baseline, plus new baseline and EWA? Three outputs to compare? Is developing a modified baseline possible? R: Important - get two or three people looking at this, but in the mean time keep going on gaming several species working with salvage rate functions based on density as a starting point. Calculate exact predicted benefit of new baseline based on density methodology.

8.   C: Two effects are being confused: 1) micro - salvage density and 2) macro - fish distribution changes as a function of hydrology.

9.   C: We can't predict effectiveness of Accord on reducing salvage in a drought as we have no empirical data from a drought under the Accord (+ AFRP) conditions.

10.   Q: If this is true then how do we figure out what is needed above the Accord from EWA? A: EWA gaming will show what added flex we have - how it might work in different situations. We won't get validation until we actually see it operate in drought and other situations. Key is how the account works, not whether it is successful at this time.

11.   Q: How flexible and potentially success will the EWA be at 200 TAF versus 500 TAF? A: Until we actually try it out there will be no assurances.

12.   C: Don't get confortable with one sequence of an historical sequence, because there are infinite potential sequences.

13.   C: We should go through the exercises and not get buried in details. Don't worry about precise results, simply gain from the experience.

14.   C: Two suggestions: (1) get small team to look at it, and (2) go ahead and not worry just an exercise using unadjusted historical salvage to see what we might be able to do to reduce it (assume it was an event that really had nothing to do with hydrology or project operation).

15.   Q: But how would we know that EWA would be big enough to handle all the problems we encounter without knowing how much of the problem we are able to take care of? A: We will only be comfortable with a large EWA.

16.   Q: Can we try a random sequencing of hydrology years to see a greater variety of potential problems? A: We should not attempt to change our basic approach to modelling that we have been relying on for years by randomizing year sequences.

Dave Fullerton - Two Alternative EWA Scenarios
Two scenarios presented.

Discussion topics:
- what are the assets we are developing?
- how are they divided among users?
- how do we incorporate assests and use into the game?
- discuss fundamental aspects as well as $ budget for EWA.
- how do we keep track of EWA?

- are there different combinations of distributing new water to EWA and projects?

Scenario or Type 1A:
- South Delta facilities: 8.5kcfs for SWP pumps with users getting all benefits of expanded capacity within existing E/I constraints. (No 10.3 kcfs capacity in first four years of Stage 1.) No sublimits on exports for either project.
- In-Delta AFRP applies.
- EWA gets any water from relaxing E/I standards and in-Delta AFRP provisions.
- Split Gravelly Ford benefits (200 TAF) between projects and EWA.
- Shasta expansion water (290TAF) to projects.
- Semitropic capacity would be for EWA.
- Delta storage (200+? TAF) split between projects and EWA. South Delta storage connected to CCF so it functions as SOD storage (with 2000 cfs transfer capacity in either direction) and an expanded forbay for two projects.
- SOD storage use restricted to 3 out of 10 years. No restrictions on NOD storage use.
- Spot purchases to EWA from $30 million per year budget. Constrained by limits on fallowing land.
- Demand shifting (short term lease on San Luis storage) to get past San Luis low point, borrowing storage from MWD.
- EWA would have access to unused project storage capacity.
- Benefits of 500,000 new low-flush toilets to EWA.
- EWA has contract for estimated supplies as other water users do to share in project benefits.
- Determine EWA by modeling new baseline (Accord + AFRP + VAMP +JPOD + expanded Banks, etc) and EWA adjusted new baseline, and subtracting to get difference (EWA).
- Projects and EWA will both get "new" water (above Accord + AFRP) - both benefit from new rules.
- EWA will be a currency or credit to do things in our game.
- EWA will be stashed in various places such as Kern WB - we will keep track on paper.

Gaming:
- Run model to get project deliveries and EWA water.
- Start model with different EWA balances.
- Budget $30 million per year or water equivalent for purchasing EWA water.
- Can borrow water to generate EWA against futures.
- Can sell EWA water.
- Incorporate financial element into tracking EWA.

Questions and Comments on Scenario 1A:
1. Q: Could we put EWA in as project facility? A: Maybe.
2. Q: How would we protect urban WQ from excessive TOC in Delta stored water? A: If we have to we will route this water only down DM canal when water would not go to San

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Luis. Monitoring will tell when to do this.

3. Q: Who is evaluating and making decisions? A: We are only understanding assets.
4. Q: How many scenarios will we run? A: 2 to 20 before we are done. We will have to do a number of iterations to adjust EWA use.
5. Q: Aren't there infinite possibilities/iterations? A: Yes.

Scenario or Type 1B:
- Restraining projects approach.
- Not a prescription but flexible control on projects approach.
- Everything is projects to compensate and provide flexibility.
- EWA gets credit for 200,000 cfs days on average - could vary year to year based on year type.

Questions and Comments on Scenario 1B:
1. C: Buys less water in dry years.
2. Q: How do we negotiate how much of new yield goes to EWA?
3. C: Financing of two types is similar.
4. C: Assets are same as 1A - decision making process is different.
5. C: Dave likes 1A; 1B is like living on welfare.
6. C: 1B has nice simplicity.
7. Q: **Which one do we choose**? A: **1A.**
8. Q: Contract or accounting? A: contract?
9. Q: Is X2 relaxation on table? A: not in next four years. (This standard has not been evaluated since inception in 1995 - no dry years.)
10. Q: Why accept risk to WQ by including In-Delta storage? A: Closes gap effectively - very effective tool. Option is to go more into market purchases with greater impacts to agricultural production. Hate to give up tool over WQ issue that has not been resolved. Other forum is discussing this issue - we can react to what they are finding. TOC shouldn't be much of problem with widely varying storage, plus we can track TOC and change use to ag only if necessary.
11. Q: Why not split benefits of enlarged Shasta? A: OK.
12. Q: Why not have water budget rather than dollar budget for purchases? A: that is really how it works.
13. Q: Does the purchase budget get lost is we don't use it? A: No, accumulates.
14. Q: Will the yield estimates be available during the game? A: Yield and capacity need to be in rules. (e.g., inport/output for GW will constrain use). Also need to recharge after use - constrained by recharge rate.
15. Q: Can we make Webb a project facility? A: Yes.
16. Q: Bacon Island plumbing? A: pumps on Bacon and CCF - deliver water to Bacon via either set of pumps.
17. C: Delta storage is listed in ISI as an asset.
18. C: We can operate Bacon EWA storage by hand as EWA asset.
19. C: Not sure what Bacon gives us for EWA.

20. C: We should add third run to model to determine EWA yield.
21. Q: How do we consider San Luis limitations:
22. Q: What about San Luis dead-storage limitation - can we get more water by lowering Santa Clara intake? Action: Paul will check on this.
23. C: We need to know what facilities and capacities we get in year 1 and year 8. A: We can show the general range of two points in time.

Afternoon Session - Biological Rules for Gaming - Bruce Herbold

i. Translate historical salvage with changes in hydrology and export.
ii. Suggest preprocessing salvage and other data to new baseline.
iii. Somehow we have to cover benefits of Accord changes.
iv. Need to show benefits from changes. Need quantitative benefits based on rules specifying credits for different actions and action levels so that we can compare scenarios.
v. Rules tell us how well prescriptive standards do versus flex benefits.
vi. Tools for each species.
vii. Points of concern for each species.
viii. Examples: if you cut entrainment assume fish escape from south Delta; move X2 down entrainment goes down; double flows and cutting exports reduces entrainment geometrically. $50\% + 50\% = 75\%$ reduction $(1-[.5]^2)$

Comments and Questions:
1. Q: Estimates of benefits of entrainment only, why not other eco benefits of EWA? A: Yes.
2. Q: Is more entrainment bad? What is population impact? A: Need abundance and distribution data along with salvage data to answer these questions.
3. Q: What about local south Delta population syndrome? A: affects relate bottom lines.
4. Q: benefit factors seem high - Does mag of factor affect decision? A: It could, but entrainment is relative. X2 water is exponentially beneficial.
5. C: Magnitude of effects may vary with different conditions.
6. Q: Do you take into account population and distribution. A: Yes. Also relate to environmental conditions that give insight into degree of risk to different populations/species.
7. C: Help SJ smolts with QWEST, VAMP, Export reductions, and HOR barrier. We wouldn't know the relative benefit of each. R: maybe; but QWEST will be cheaper than VAMP extension. We should aim for comparable data.
8. C: QWEST problem or SWAG - comfortable with giving to team, but need to clarify assumptions up front. For example that entrainment reductions result in population increase. We should lay out assumptions even though we may disagree with them. R: How we reduce entrainment is most important. We can simply reduce entrainment and not consider population response. Entrainment effects on population can simply be assumed.
9. C: Kimmerer and Bennett concluded that entrainment doesn't affect the striped bass

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population. R: we don't have to get the entrainment - population response relationship exactly right. If we determine later one way or the other, we can change priorities and use of EWA accordingly.

10. C: We need to clarify scoring and details for modelers. Need Biol Eval Criteria. We need to keep score.
11. C: We don't want to rely on one tool.
12. C: We need to justify our scores.
13. C: If we can't agree on scoring, then we can't decide on how big EWA should be.
14. C: Bothers me that two prescriptive agencies are just sitting back and not saying anything. R: FWS - Gaming approach so far is a good starting point. We should justify assumptions. Need to guess, but can't put level of assurance on guesses. NMFS - less optimistic because data may not exist to support assumptions. We should admit we are guessing and make the most of it.
15. C: In December we had concept that some things were better than others. Can we at least agree on priorities? We all agreed that closing DCC had positive benefits. We all agree we can improve things.
16. C: We want teams to focus on biological values other than just entrainment reductions. We should propose guidelines / rules for other benefits as well.
17. C: Values / benefits depend on context. Indirect effects need to be part of process.
18. C: We can come up with equations for indirect effects. For example 1 km of X2 is same as 1000 cfs.
19. C: What about interspecific scoring equations - both negative and positive.
20. C: Values of actions may change with circumstances - population levels at time.
21. C: Coming up with equation coefficients for these things will not be easy.
22. C: We won't have the biological feedback we want in gaming. We will lose site of what the gaming is telling us if we are too concerned with biol feedback limitations. We won't get hard numbers on benefits.
23. C: We should have benefit factors for changing hydrology and operations. We should clearly define these and the conditions for differences.
24. C: The historical context is essential for this. We can interpret salvage changes and population benefits based on our knowledge.

Agreements:
- Need a set of biological modeling guidelines or criteria.
- Teams should provide.
- Default would be Bruce's rules.
- Some of his rules are more important than others.
- Need to consider context in which the rules are employed.
- Some factors are additive and some are not.
- We should correct the default rules as best we can using teams.
- Agreement predicated on biological team assessments.
- A broad tech team should refine assumptions.
- Teams will revise criteria.

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- Teams will need data to do this.
- Team will start 9 am on Thursday.

Key Questions for Tech Teams

1. How does the location of X2 affect the distribution and entrainment of delta smelt?

2. Under what conditions is direct mortality a significant fraction of the population of important species?

3. How does SJR flow affect survival of SJR smolts?

4. How do export levesl affect survival of SJR smolts?

5. What are the benefits of closing the DCC?

6. How is the location/entrainment/survival of important fish affected by QWEST?

7. How does the HOR barrier affect the direct mortality of important fish and survival of SJR smolts.

Afternoon Session - DWR Modeling Support - George Barnes

- CALSIM will not be a factor in our gaming exercises. It won't be ready until summer.
- DWRSIM will continue to be an important tool for gaming.
- We will focus on how export constraints play out - modeling will show how much borrowing will turn into real cost.
- We plan to run two year sequence studies - essentially this provides 72 combinations of differing outcomes that provides us with range and frequency of occurrence. We are using this approach now to study VAMP effects. For example: we normally run a sequence of three years like 87-89. Now we will run 72 sequences starting with 87-89, then adding sequentially 87, 22, and 23, the 87/24/25, and so on.

1	1987	1988	1989
2	1987	1922	1923
3	1987	1923	1924
4	1987	1924	1925
...	...	...	...
72	1987	1996	1997

- This sort of analysis can be done for many of our decision processes.
- Helps gain feeling of risk.
- Q: Can we do four year sequences? A: three-year shows most information, but 4 yr would provide more information that may be of value.
- Q: The longer the period the more chance of getting a wet year reset. When would we

have to pay? A: First dry year.

Afternoon Session - Biological Gaming Approach using Daily Model - Peter Louie and Russ Brown

Gaming tasks: agreement, assignments, and evaluation of results.

The exercise shown was a product of modeling subteam meeting with project operators and their forecasting models along with Peter Louie's and Russ Brown's models. Both DWR and BOR have operations models for forecasting water allocations. Operations models work on inflows and exports to adjust operations to meet all demands and standards (e.g., Delta outflow, WQ, and X2). Flood control is also considered. Models also help in balancing cuts in deliveries when necessary. Models are less certain the further out you try to forecast. Models use 90 % exceedence. Models also use criteria for temperature models.

Q: Was the Ops Model used? A: Yes, key elements; will put into Russ's Daily Ops Model.

Russ presented his Ops Model
Russ showed output from model for one year. He showed how one adjustment immediately works through the model in real time as would occur in gaming process. Hopefully he will have all the features working by next week for gaming exercise.

Comments and Questions:

C: The game is different than you have it set up.
Q: Can you use QWEST? A: Yes.
C: More here than we need for gaming exercise.
Q: Can we just use some of model capability? Just 4 tools? A: Yes
Q: Do you incorporate the new baseline of the Accord - VAMP - AFRP? A: Yes.
Q: Can you use model in conjunction with DWRSIM? A: Yes, we can blend together.
C: DWRSIM has a monthly allocation procedure the steps through the months - 99% sure we can deliver the water.
C: Need a summary table that give us key outputs.
Q: We also need the intermediate steps to provide results for the scorecard - can we calculate a score? A: yes.
Q: Next we will have DWRSIM runs - will we have this tool ready by then?   A: We can have a summary spreadsheet output.
C: We have two tools that have different baseline simulations. We should use the DWRSIM output in the daily model.
C: We have two different models - one is a planning model and one is an operations model. Daily ops model is more real time.
C: There is a risk of a feedback problem with the Daily Ops Model.
C: Operators have provided input to make the Daily Ops Model realistic to current standards.

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C: We need a simple way to show results. We should use monthly DWRSIM with a realistic baseline.

C: We could put the monthly output into the Daily Ops Model output.

Q: What do we need to change to make Daily Ops Model work next week for the gaming?

Q: Where are we? Is this a disconnect? Should we use Daily Ops Model?

C: We will be in trouble if we do because of different baselines.

Q: Can we take output from DWRSIM and make adjustments to Daily Ops Model to make the models more consistent? Blend the two?

C: Competing models is less than ideal. Blending is lovely. Daily will be valuable if we know its limitations. Not sure how daily ops reoperates system.

C: If you change prescriptive rules, the whole set of hydrology will change from the historical. If Russ can make adjustments that reflect reoperation than maybe we can get closer.

C: Accord has a different overall system to export water, and Daily ops model does not recognize that change.

C: We could adjust Daily Ops Model by tinkering with basic benchmarks from DWRSIM output. We tried to benchmark with operators not DWRSIM.

Action: Get modelers together to sort this out.

C: Both models give us important insight.

C: Daily ops model shows us daily thinking process. Will have value in gaming.

C: How will new concepts work in the daily model.

Action: Russ and Peter need to look at Bruce's list of resource needs.

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